

Sept 13"/95
Section from Belton east
on line of Gt. Northern
RR.

At Belton greenish
shalest massive beds of
cal-argillite-like rock
dip - northw. about 40°
Bluish banded limestones
come in on top of the
~~strata~~ - greenish beds. The
limestones are heavy beds
2 to 4 feet thick & quite
pure in some layers. No
traces of life with the
exception of a Stromatopora
- like form. The strike
& dip of the beds vary
but the section appears
to be practically un-
broken & to consist of
a portion of the "Castle
Mt. Group" of McConnell

The railroad comes in
 + runs along the strike
 following the bends of
 the Middle Fork of the
 Flathead river. About 7^{mi}
 from Belton some reddish
 beds of cal-argillite
 appear along with the
 greenish beds. There may
 be 2000 to 3000 feet of
 the limestone. A flat
 3 1/2^{mi} of track - extends
 from last RR cut to
 Nyack. (Camped at 5 P.M.
 after a day of almost
 constant rain / 2

Sept. 14"/95

Out from Nyack.

Cut on strike of
 greenish shaly beds - 1 1/4
 mi. E. reddish-purple
 + green beds alternates
 Buff-grey - banded brown

3

76th 680.

St. N. 30° E Mag. 20 ft
dip 35° E. 30° N.

²⁰⁰
~~200~~ feet thick -
2nd Red beds, cal. argl.
passing up in sand
shaly beds (red)

2600.

l. greenish cal. argl.
700 passing in alter-
nating red & green
bedded beds.

2400.

Track follows strike of beds
about 500' S. of Myack. On
the N. side of ruin
at least 2000 feet of beds
shown in the side of the
mt.

Cretaceous
 2 ^{mi} west of Paola the
 road cuts the Cretaceous
 shales - sh. E & W. Mag.
 with 20° N.

Stems of plants occur
 in the shales.

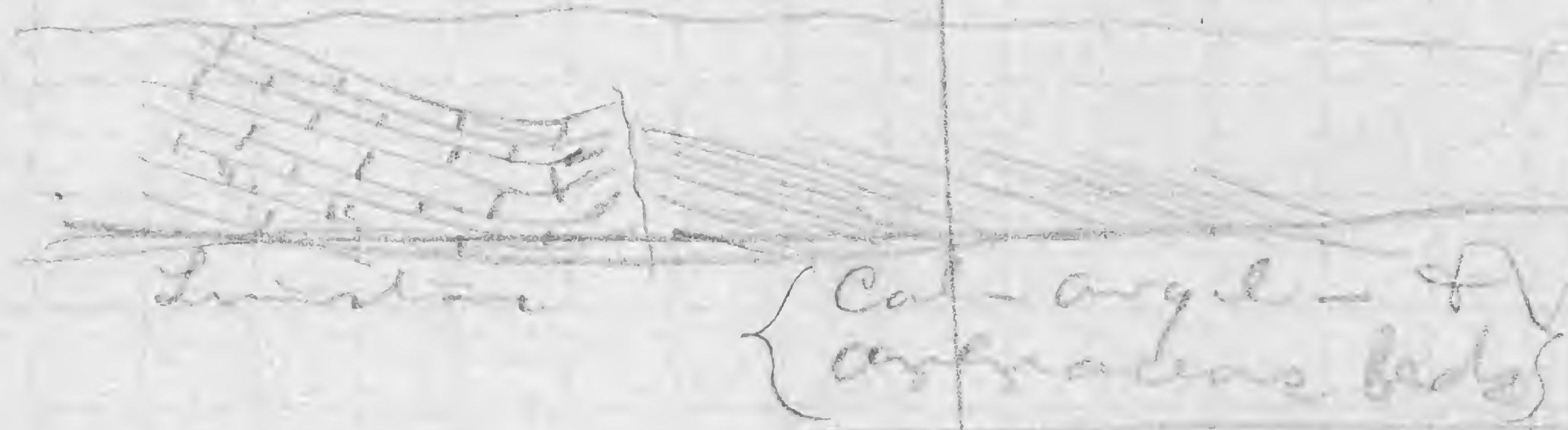
Cattle NW 1/4 Sec.

1 1/2 ^{mi} E. of Paola the
 red shales - calcareous
 appear in a R.R. cut
 sh. N. 80° W. (Mag)
 dip N. 30°

The Cretaceous terminates
 about 1 ^{mi} E. of Paola.
 Sept. 11/95

The Red ^{green} beds extend
 east of Essex to Jara
 when massive bluish
 layers appear. In cuts
 between Jara & Bear

across the limestone sh
 E + W. (mag), dip 20°
 N. The beds rocks
 are evidently the massive
 Castle Mt. Gneiss of
 McComell. The general
 strike runs to N. 60°
 E, & dip decreases to 15°
 N. 2 mi W. of Bear
 Creek a syncline & fault
 occurs that brings up
 the green & red beds
 beneath the limestone



These beds extend up
 to & across Bear Creek.

Cryptozoa⁵.

about ~~500~~⁶⁰⁰ feet below
the lava bed, Cryptozoa
occur abundantly
in a thin bed of
calcareous sandstone.
The specimens average
about 8" in diameter,
a few reach 12" & small
ones occur. They run
12" to 6" in depth.

Between Java &
Essex the Black
foot line rises &
the purple & gray
reds appear &
below about $1\frac{1}{2}$ mi
above Essex the
purple, greenish
& drab shales
beneath the Ryls

Sept. 10/95

Bad water Canyon
 Great Northern RR, near
 Leelanau.
Geology

1. Banded blue & gray
 arenaceous ls. 1000' @ 45% 700.

2. Dark bluish l - in
 massive beds. 250' @ 45% 630

3. Greenish calc. ls. -
 before truth many
 calcareous nodules (small)
 2250 @ 45% 1600

4. Dark bluish ls.
 (similar to 2) 500 @ 30% 250

5. Greenish, banded
 massive or siliceous
 ls. 4750 - (30% - 28) 2200

to 5200

$\frac{H^2}{30}$
1320

6. Alternately green &
purple argillaceous
+ ss beds (massive)
lignum - forming a
about 100 feet in
sea green - 1300 @ 200
450

6^a lignum forming
down into purple
masses 6 - 1000 @ 200 350.
6000

No fossils. No well
defined base or summit.

Part of Mclellan's
Castle Mountain? Sh?

1
High gray massive
limestone in blocks

2
Lower Cambrian

4
2500
1500
1000

Beltway 3

3' in
sagging slightly -

Light gray massive limestone
in blocks, layers

High 00

West face of Spranger bridge & Canal Bridge 13-14 - Canal

Washington River

a) E1140 (Cathedral) formation - Upper Cambrian 1800-1540' 121.9

b) But. way to. No. 100' of a way - " 400' -

Upper limestone & sandstone shales -

a) Beltway

Between the lower Cambrian limestone & the base of the E1140 (Cathedral) there is a covered space of about 500 feet in thickness of beds - with many of the Middle Cambrian Burian formation. The limestone still extends to the westward (away)

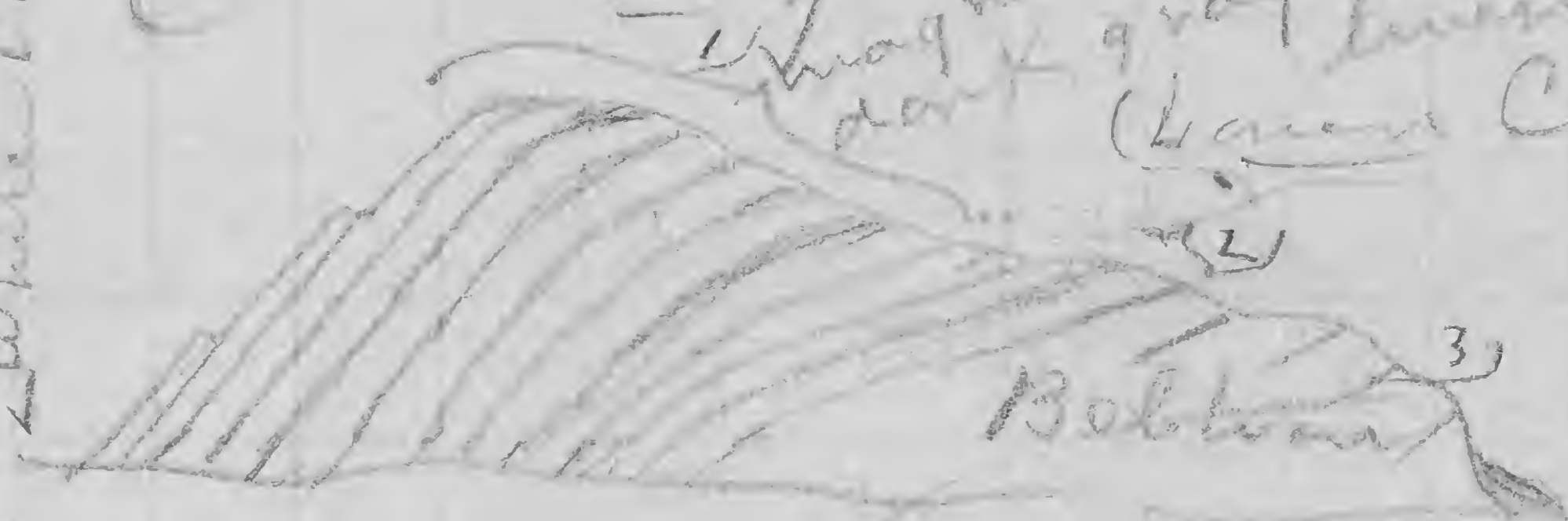
on the north-eastern side of the
mountain.

Granger Mountain Section
Location. In range

formed by White Creek
& Keotaway river about
four miles (10 mi) east
of Keotaway bridge
Canal Flats B.O. Can
termination. Look the
old Granger ranch at
the west foot of the
mountain on the
Keotaway river.

Altitude About 4200 ft

(m) Magnesian light magnesian
dark gray limestone,
(Lower Cambrian)



N.E. —

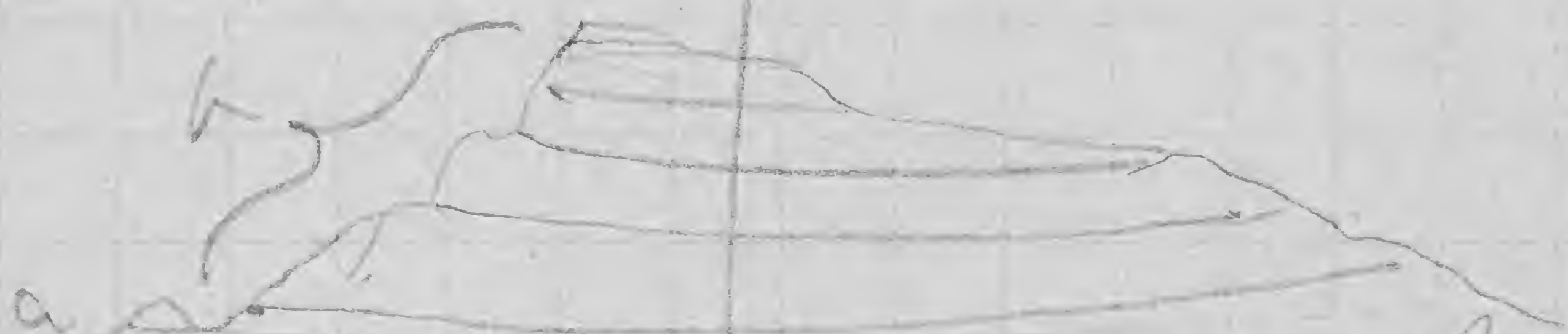
S.W.

Not S.W. section, see
next page for west face
section. 7-10-23.

Flower Park Sept 14/95

Castle Mt. G. h

Mud Creek Canyon
12 mi N. N. E. of Nyack.
Mont.



Red & gray calc.
argill. & hard beds in massive
beds - 2500 feet 3540'

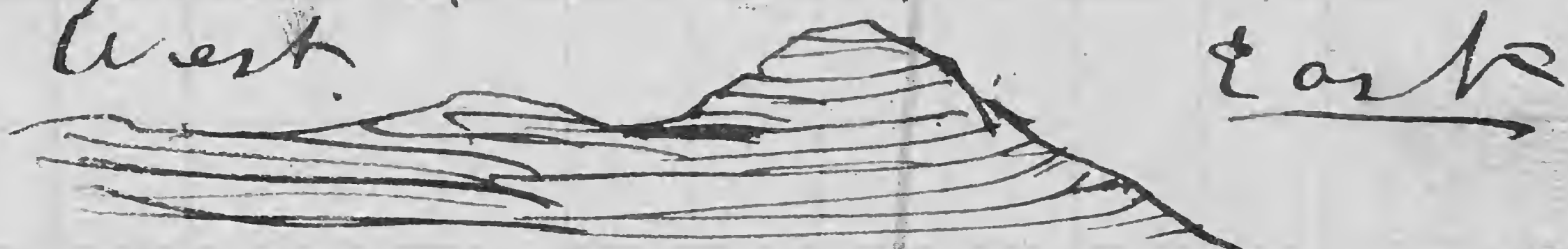
D. massive bedded gray
limestone. High point
on E. side of Canyon,

See photographs
taken at sunset.

Sept. 19/95

at the head of Nyack

Creek a fine amphitheatre
is eroded out of the Red
Beds & superjacent calc-
shales & limestones. The
Castle Wk rocks form
fine ridges & peaks along
the Rocky Wk divide
for many miles. There
is evidently a fault
in the East as the
strata rise & end abruptly
as far as could be
seen
West



Ten minutes after divide
was reached a storm
of sleet followed by
snow drove us back
to the valley below
& to camp.

Sept. 14"/08.

An high summit N.W. of
Bear creek section house on
S.R. Ry.

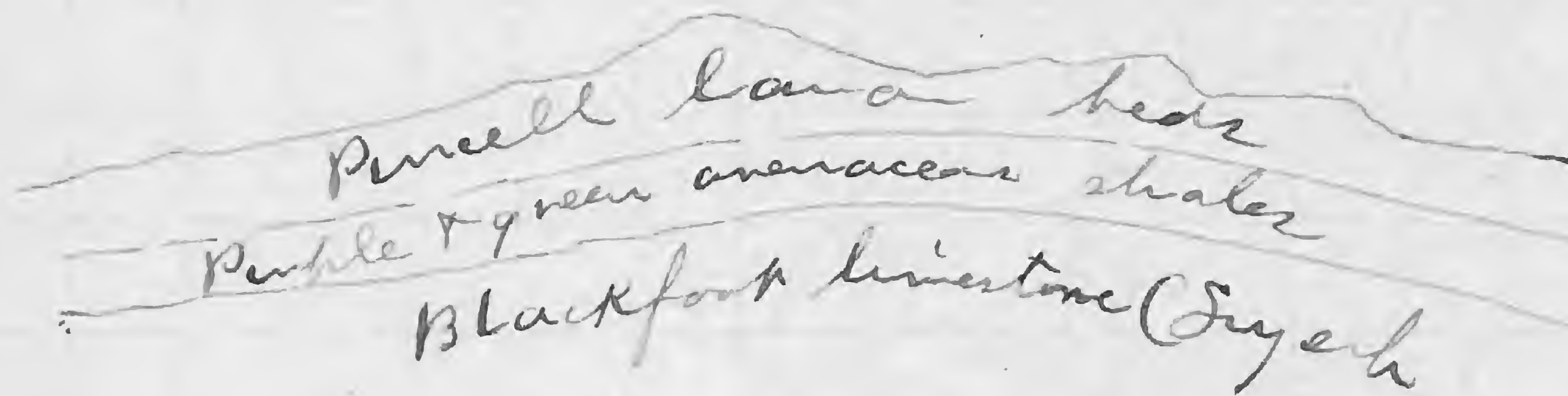
A wilderness of Algonkian
rocks - in all directions.
The high ridge west of Eng~~o~~
& ~~Paola~~ Paola is formed of the
Blackfoot limestone with
superjacent red & greenish beds
of the Camp creek series -

South the same series for
15 miles or more - East the
upper series (Camp creek) with
the Purcell lava beds &
below the Blackfoot lm.,
North the Camp creek
series.

N.E. a high point of
the Blackfoot limestone on
the Continental divide.
Took photographs but
clouds were heavy.

Sept. 13th 08

Algonkian (Marion)
Gr. Northern ~~devils~~
Pass on Continental
Glacide.



Purcell lava beds
Purple & green arenaceous shales
Blackfoot limestone (Snyder)

The Purcell lava bed caps
the mountain on the
north side of the pass & also
the hills on the south
side. Below the purple
& greenish arenaceous shales
& thin bedded rocks extend
to the base of the ridge.
On the west slope of the
Pass the Blackfoot lime-
stone is exposed & extends
for 5 miles south west
forming high hills on both
side of the canyon of
Bear Creek.

Belton to Nyack
Sept. 10/08.



Algonkian -

About a mile east of Belton the basal beds of the Holland limestone appear dipping east 20° N. (mag.) The alternating limestone & siliceous shale & argillite continue on up the canyon of the Middle Fork of Flathead river to the west edge side of Mud Flat where they are capped by the Purcell lava bed.

There is a beautiful exposure of the Holland limestone ~~and the~~ along the river & railroad.

Fossils Gunnigh Pass
Fossils in Sijerk

An ~~east~~ ^{east} side of Gunnigh
Pass & above head of "
lake -

Varied forms of a small
Cryptozean occur abundantly
in dark bluish gray lm. - above
the buff weathering thin bedded
lm. - Also many small
arching   sections
that appear to be sections of
shells - I think they are
the concentric laminations
of the Cryptozean. They assume
many imitative forms which
might lead to thinking that
sections of brachiopods &
gastropods were present.

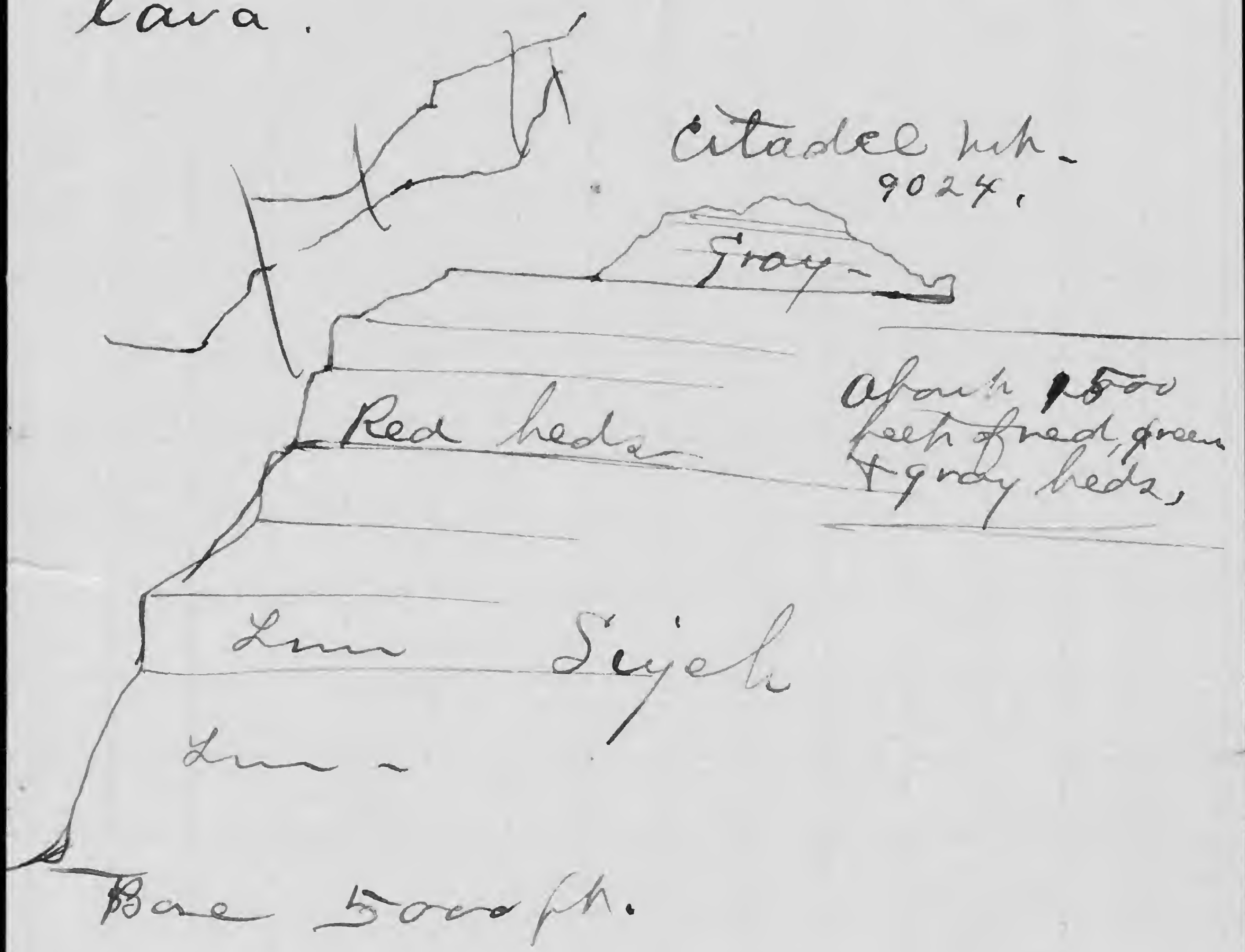
Near Kiptz Cabin we found
Cryptozean abundantly in the
arenaceous beds above the
Sijerk & below the Powell
lava bed -

Thus far there is nothing

to ² Indicate that the Lijeh-
or superjacent Kintta is any-
thing more than the Bellean
series of Algonkian.

Obtained some very good
specimens of a small species
of Cryptozoa 1st to 2nd in
diameter. Material for
sections - & silicified specimens

Citadel ³ Sunlight Pass
~~Cathedral~~ Mtn. S.E. of Sun-
light lake. Its section shows
Lijeh ^{lm} about 1/2 way up & then
reddish, greenish & gray arenaceous
beds to the top. No Percell
lava.



Aug 7th/08

Algonkian.

Sunright Pass.

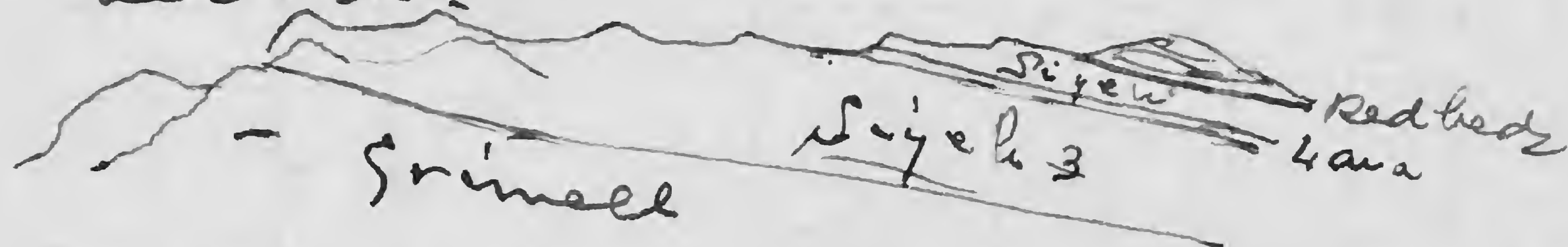
At Reuten lake ^(5914 ft) west of the
Pass (7000') the chocolate brown,
reddish, gray & greenish thin
bedded compact arenaceous
rocks of the Grinnell formation
outcrop with an easterly dip
of ~~about~~ 20°. These extend to the
nearly the summit of Sunright
peak ⁽⁹²⁵⁰⁾ giving a section of 3000
feet. Above the Grinnell
beds the Pigeon limestone
shows finely as its slopes
continue to the lower
end of Sunright lake ⁽⁵²⁷⁶⁾.
On the north side of the
lake the lm - extends up
the slope of Fusilade ⁽⁸⁷⁴⁷⁾ mountain
to the an intrusive lava
flow. 2500 feet & above the
lava 700 feet where, arenaceous,
reddish brown ^{& greenish} strata similar

2

Sunlight Pass

to the ~~strata~~ Grinnell formation
continue to the top of the
mountain - 400 feet +

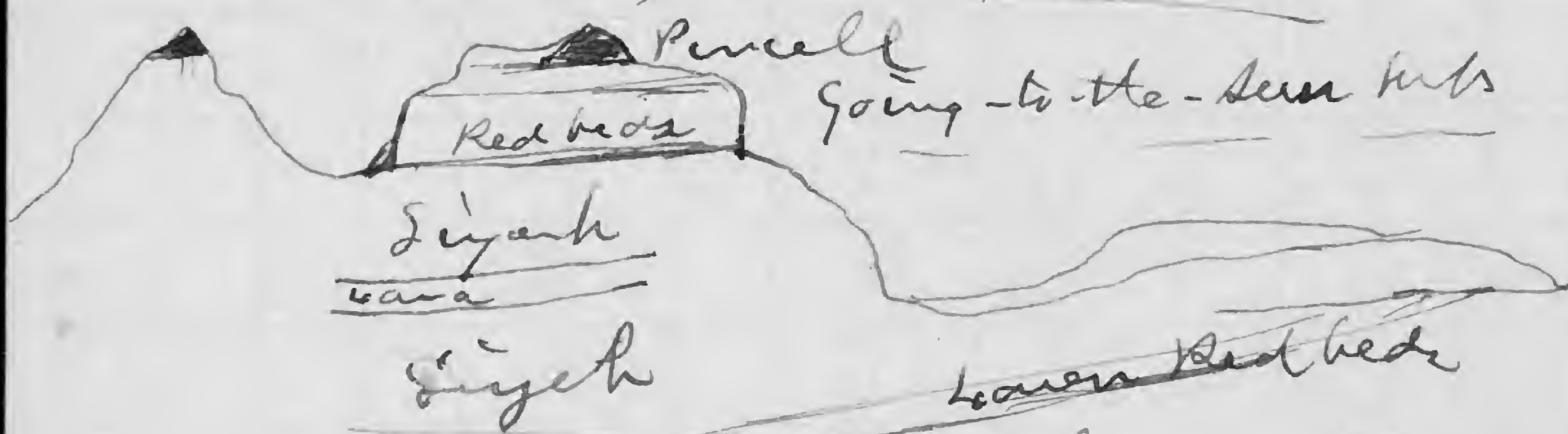
Secton -



~~Grinnell - 3600 ft.~~

Post Siyeh - 400 -
 " 800 -
 " (Lava) 25 -
 " 2700 -
 Grinnell 3600 -

Eastward the dip flattens
out & the strata rise with
a westerly dip in going to
the - sun mountain and Siyeh
peak (See photos)



Siyeh Peak appears to be capped
with Pencil lava -

Sept. 22^d/08

Algonkian.

Helena limestone.

Examined Helena limestone beneath Cambrian sandstone east of Helena, Mont. In lithological characters & stratigraphic position the Helena limestone is the equivalent of the Blackfoot limestone of A. U. of Helena. ^{the reddish} Arenaceous shales and sandstones appear ^{above} ~~beneath~~ the Helena limestone and between it & the Cambrian sandstone.

The Blackfoot limestone is the same as the Holland limestone & this season I have traced the Holland into the Trench limestone, along the line of the Great Northern railway between Coeur d'Alene & the Summit.

Algoukian - Sept 21/08

At the Great Northern Pass over the continental divide the Algoukian Blackfoot limestone has been thrust eastward over and on to the Cretaceous on the north side of the Pass. At the Pass erosion has removed the Algoukian strata so that the Pass for a half mile west of the summit is in the Cretaceous. The latter strata extend south of the Pass for several miles forming rounded, wooded hills.

Cretaceous

= Summit of Pass.

Algoukian

The low pass over its existence to the breaking down of the hard Algoukian rocks above the soft Cretaceous shales & sandstones -

Aug 6/08.

Taking photo at Gursight
Pass.

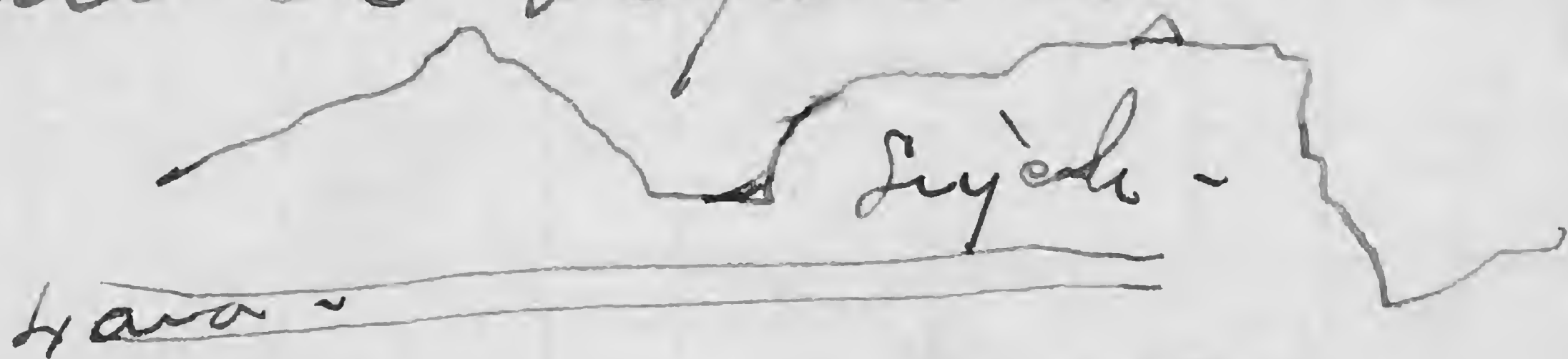
Air hazy with smoke.

6x8 films.

1400 feet of Grinnell formation,
from lake west of Pass to
summit of ridge. About
1600 ft. All sandy shales
& thin bedded sds & quartzite
sds - maroon red & greenish
in bands.

Pinacle of Grinnell beds on
N. side of Pass.

Going to the Sun
~~Juniper~~ h. capped
with Lignite h.



Red beds

Over

Banded beds of Grinnell
as seen in N. slope above
Gunsight Lake.

Gunsight Lake -

Renton Lake

8747.
5276

3471.

8338
5914

2724

blonde

from

oil

crack

reaction

above

sympath

sympath

sympath

sympath

sympath

sympath

sympath

July 14-16/08

Locality 320 - of C.D.W.

Algonkian -

Beltonia danai zone of
the Alton limestone. The
fragments of the crustacean
occur in immense numbers
through about
100 feet of shaly & thin
bedded siliceous limestone.
Fragments 4 to 5 inches across
are frequently found.

Loc.

About 2 mi E. of divide
at head of north branch of south
fork of Old Man river
west of Pincher Creek -
Alberta, Canada.

Algaikura July 28/08-

Watentat Lake.

At the foot of Waterton
lake the Waterton
dolomite (Waly) outcrops
at Cameron Falls. on the
west side of the lake. A
low anticline exposes
about 300 feet of the
section. The Alton
limestone arches over
the dolomite & dips to
the south. This in turn
is overlain by the Affe-
Kunzy & Grinnell arenaceous
formations and at the
south end of the lake
the ^{Waly} ~~Waly~~ ^{Waly} limestone. At
Valentine creek the 1000
feet of grey siliceous strata
above the Lajsh are well
exposed ~~for the~~ (Valentine
formation) & on the east

2

slake of Kootenai peak
the section shows the
Russell lava bed capping
the Valentine & above
that the Sheppard for-
mation & at the summit
the Kintla formation.

Cameron (Oil) creek section.
From Cameron Falls the
Altyn limestone dips
slightly to the west & the
section is continuous
thru the Applegate -
Grinnell & Lynch forma-
tions. (Walsh's section)

The Valentine formation
with the superjacent Russell
lava bed. Sheppard &
Kintla formations form
bold cliffs on the west
side of Little Kootenai
creek for about ten
miles ~~into~~ south of

Waterston Lake. Above
 the gray & purple arenaceous
 beds of the Labret
 formation the Purcell
 lava bed 125 to 225 feet
 thick is a marked feature
 for miles. The lava
 bed slopes down to the
 little Kootenai creek
 about 1/2 mile up from
 the southwest head
 of the creek. It also
 forms a broken ledge
 along the Continental
 divide north of Kipps
 Cabin.

In the Kootenai peak
 section the buff weathering
 hard, arenaceous shales
 & sandstones of the Sheppard
 formation cap Kootenai
 peak & extend west with
 west beneath the deep
 red beds of the Kintla
 formation.

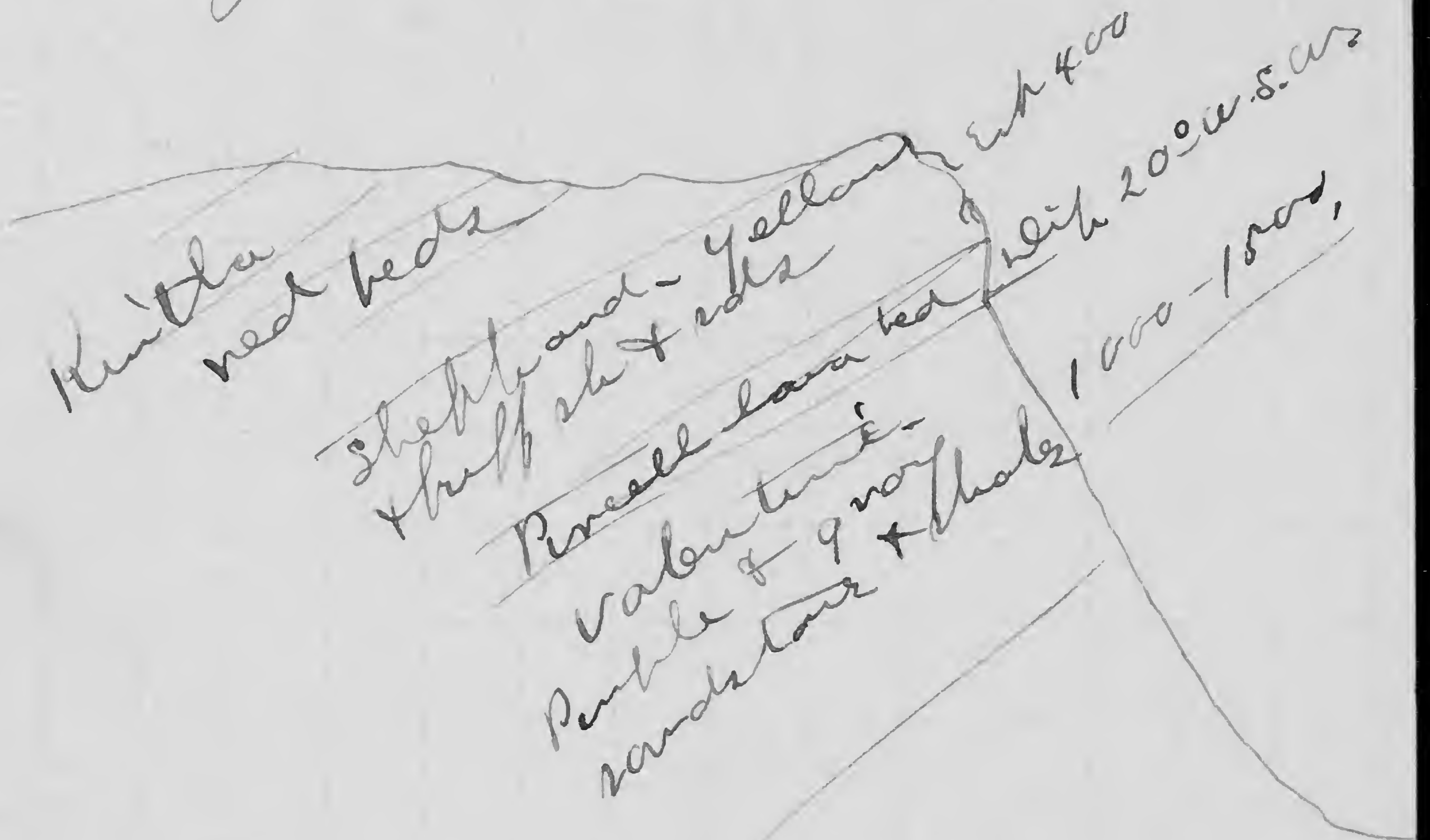
The Kinitla ⁴ forms the higher portion of the western ridges & slopes westward towards Vulture peak & the ridge south of Quartz lake.

Flatoh & West Flatoh mountains are capped by the Kinitla red beds & form the bottom of the syncline extending south toward Cannon & Clements mountains.

To the north the strata of Kootenai peak form the eastern, interior, side of the syncline & the strata of Vulture peak are on the western limb, both being the red beds of the Kinitla formation.

The section off Kootenai peak is roughly as

as follows



No limestone was met with
for 1000 feet below the Russell
lava bed.

Algonkian area 7-18-08
B.C.

From the high ridge directly
east of the divide at the
head of ~~the~~ ^{the north branch of the} south fork
of Old Man river over
the Trinity passes to Flathead
valley. there is a grand
view of the Rocky Mts
from the interior of the
range: the back slopes
of Castle Mt. Victoria
Peak, on the east: the
north slopes of the Kintla
& Boundary ranges: the
masses of ridges & points
between, to the south: the
~~mass~~ of broken ridges
& peaks to the north with
the high summits along
Crows Nest pass & north
to the limit of vision -
On the south the red
beds of the ~~the~~ Grinnell
formation cap & band

2
long flat top ridges &
in the M. the green
Sierran limestone rests
in massive cliffs above
the red beds.

The general structure
from the Flathead valley
eastward is about as
follows. (See photo of July 19/08)



An occasional thrust
fault on a small
scale is indicated -



a block of strata 8 to 12
thousand feet thick that
is 20 x 40 miles undulates, ~~shows~~
quadriversal dips - small
sharp folds (monoclinial)
small domes & facing
east the upheaved


edges of a ~~thrust~~ mass
thrust over the Calta-
ceous.

The ^{Siye} ^h ^{lun} is
confined ^{on the east peak} to the region
south of Castle Mt.
(As seen from this ridge)
It occurs on the south ^{side} of
~~the~~ ~~mass~~ ~~is~~ ~~seen~~ ~~between~~
~~the~~ ~~east~~ ~~&~~ ~~west~~ ~~line~~ ~~passing~~
~~through~~ ~~Castle~~ ~~Mt.~~ ~~&~~ ~~the~~
~~North~~ ~~Kosterway~~ ~~Pass.~~
~~West~~ ~~of~~ ~~this~~ ~~area~~ ~~is~~ ~~occupied~~ ~~by~~
~~pre-Siye~~ ~~Algonkian~~
~~formations.~~ (See on back

Fossils

Passed over fine
outcrops of Allyn lime-
stone & shaly limestone
but could not find
trace of fossils except in
the Beltrami beds. These
are about 100 feet thick
& contain thousands of
fragments -

July 28th/08,

a large block of Siyeh
limestone occurs on the
west of  pass. It is
faulted down. The red
beds appear from beneath
it on the east in the
canyon & a ~~thin~~ sill of
lava shows as a dark
~~thin~~ ^{narrow} band about 500
feet up in the limestone &
conformable with its
bedding.

July 15/08

Algonkian.

B. C. & Alberta.

Two miles south of
pass over Continental
divide a low anticline
of Altyn (Newland)
limestone occurs with
an east & west axis.
About 200 feet from the
base Beltonia danai Walcott
occurs in great abundance
~~as~~ fragments. It extends
thru about 200 feet of
thin bedded dark gray,
& shaly, siliceous & magnesian
limestone. Above
the limestone ~~is~~ areaceous
thin bedded strata continue
of 4 to 5 hundred feet.

Estimate for Altyn -

600.

Apperbury -

1600

Grinnell -

2000.

Lynch.

1000+

All the area between the 49th Par. - in the south the Flathead valley on the west. The Carboniferous & Cretaceous along south of the Crowsnest pass route bound the north line of the Cretaceous of the ~~east front~~ eastern foothills of the Rocky Mts, is underlain by Algonkian rocks.

No traces of Cambrian (Castle Mt. series) or Carboniferous limestone were noted in this area. It is the uncolored area on Dr Geo. M. Dawson map of 1886.

24 July
1929

North Fork Blackfoot River,
Montana.

On a general trip up the river examined the various outcrops, particularly the more massive limestone layers. Practically everywhere these beds, as well as limy layers, lenses and stringers in the shales, show that they are of algal origin, even though most of the beds are now rather strongly metamorphosed.

Some of the black shales, which appear to be the exact counterpart of much younger black shales, sometimes even appearing as oil shales, bear fragments and markings that closely resemble the Burgess shale algae.

27 July
1949.

Between Phillipsburg and
Georgetown Lake,
Montana

The road across this divide runs
practically all the way in the
Belt series. A thick bed of
the fine black shale is here
exposed.

27 July -
1929

Stellako Pass. Montana.

[Sapphire Range]

Crossed the range from the Bitterroot Valley side. All the rocks on the western side are Archean gneisses. Just below the falls, where the road follows Darby creek to the northeast for a number of miles, several thousand feet, perhaps, of the Belt series are encountered - then the road again traverses the gneiss.

Nehant Road.
Little Belt mts.

12 August 1927
with R. S. Bassler

Flathead horses hills and tanks
as usual.

Wolsey shale crops well along road
consists of green and purple shales
with micaceous sandy layers and
higher up limestone nodules and
bands both with fossils.
Asaphiscus capella was noted on
the s.s.

Newland Creek,
Montana.

11 August 1927
with R.S. Basler

Dip 30° W

Section looking at the bottom (east).
Contact of sandstone in Siphonaria shales
not shown, covered by shaly sand
material.

[Facing the outcrop gave the
following horizontal distances. The
thickness of each layer is to be
computed from the 30° dip.]

130' x 35'

650'
thick

Dip.

Quartzite of the usual flathead type.
Crossbedded, cherty. Toward the base
layers of hematite. Some of the
beds contain considerable fusoids.
The topmost layers become sandstone.
The exact limits are perhaps a
few feet more or less than from the
measurements.

Syncline rock. (Sample taken) (with 6)

150' x 35'

75'

600 x 30°

300'

310 x 30°

165'

Micaceous shale. Contains thin beds of
sandy soft shale.

At 2' from top is an all Calymene zone
or Siphonaria. Fossils are preserved
all 2' zone.

465 x 30°

233'

At 1' from top is a Asaphus tail
with a few brachiopods. coll. 3.

Then the same, within a thin layer
of limestone containing numerous fossils
coll. 4.

total
708'

90' x 35'

450'

Blue, pale little homogeneous limestone.
Fossils fragments shown. Siphonaria (coll. 5)
near base. Some chert here.

Much igneous intrusions of several
kinds & sizes. Igneous rocks constitute
(see sheet)

Montana

11 August 1927

(Sheet 2)

more than three-fourths of the entire formation. (Samples taken Call 6)
The igneous rock occurs in the
above the road but the limestone
occurs above these outcrops.

125' Sandy shales, not well exposed.
Fossil fragments probably present.
Some of the beds are somewhat
calcareous.

330' Limestones, thin bedded, little blue to
gray well jointed. Some micaceous, some
chocolate and edgewise. Fossil fragments
obvious fossil fragments.

125' Limestones. Thin to thick bedded ^{cliff forming} much pebble
and some edgewise. Oolitic and with
113' glauconite. Fossil fragments numerous.
Few identifiable fossils can be secured.
Crepicephalus fauna.
Contains a few small bivalves.

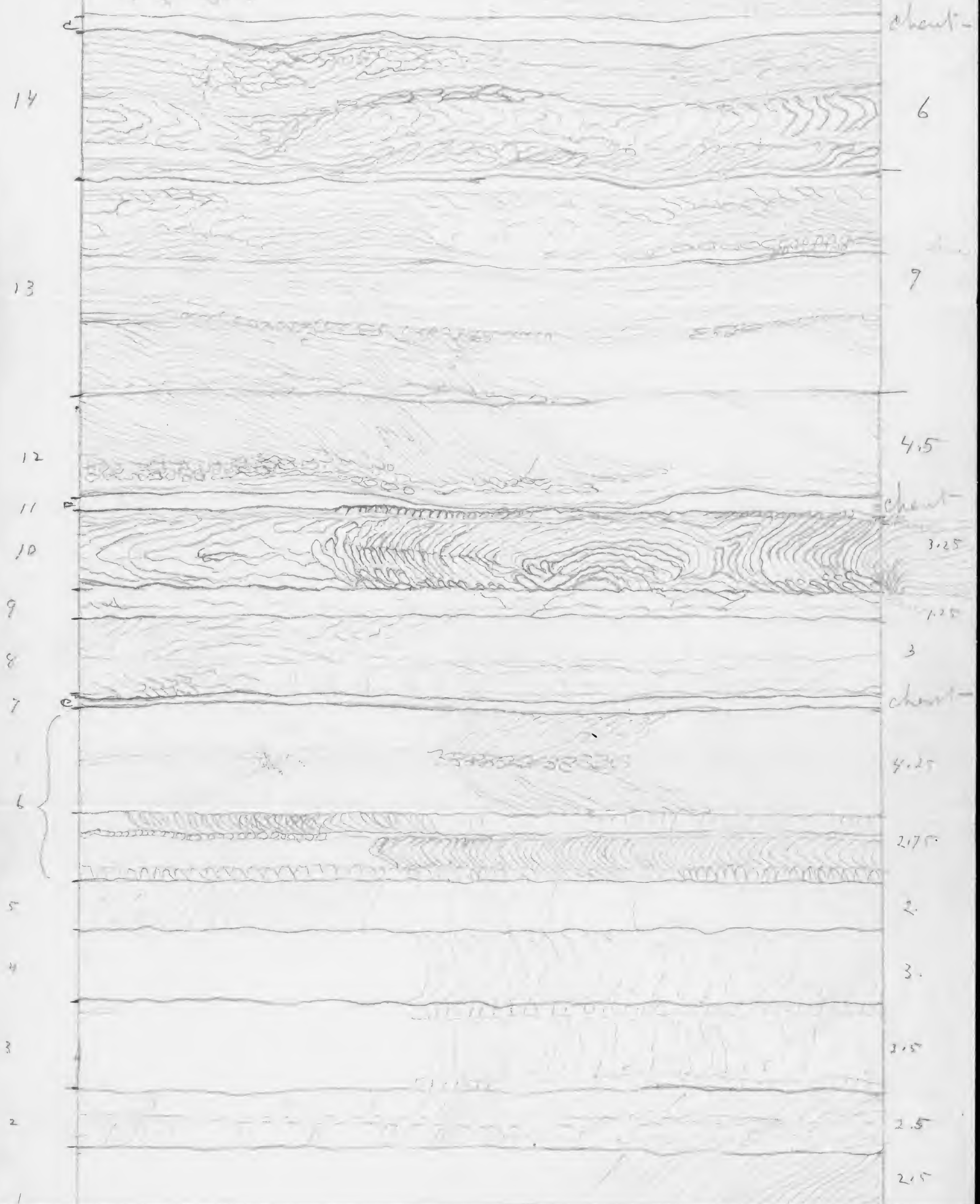
Evolution? Red beds. Thinly calcareous sandstones in
layers up to 10 inches thick interbedded
with purple, red, and light green
shales. Unfossiliferous. It contains some
lighter limestone layers.
Thin bedded gray limestone. Devonian.

(locality 400L)

1641

radiolaria
fossils
in situ

mostly banded



7-7-1900,

Cambrian section

Beaver Creek, N.W. end
Big Belt Mts. mark.

Siliceous, slaty, dark shales
of the Grayson formation,
Belt terrane.

Str. N. 42° W. (mag)
dip S. 48° W. 30°

Flathead sandstone.

1. Gray - massive bedded
quartzitic sd. - with
a few ~~fine~~ conglomerate
layers lined of small
qtz pebbles +

Str. N. 58° W.

dip S. 32° W.

Strike increases to 40° near
top of ridge then back to 35°
that to N. 50° W.

gradually ch to 75°

$$\begin{array}{r}
 32 \\
 \underline{160} \\
 24 \\
 \underline{184}
 \end{array}$$

4 -	19
2 -	<u>21</u>
2 -	5
2 1/2	<u>105.</u>
2 1/2	15
4.	<u>120.</u>

$$\begin{array}{r}
 \cancel{119} \\
 5
 \end{array}$$

$$\begin{array}{r}
 \cancel{121} \\
 5 \\
 \hline
 605 \\
 90 \\
 \hline
 695
 \end{array}$$

3

Comburi. (2) Beaver Creek.

At 225 feet thin
bedded $\frac{1}{3}$ sds occur &
again at 355 a band
of thin beds come in.
At 640 feet the massive
beds of $\frac{1}{3}$ sd - give way
to shaly sds & shales.

640

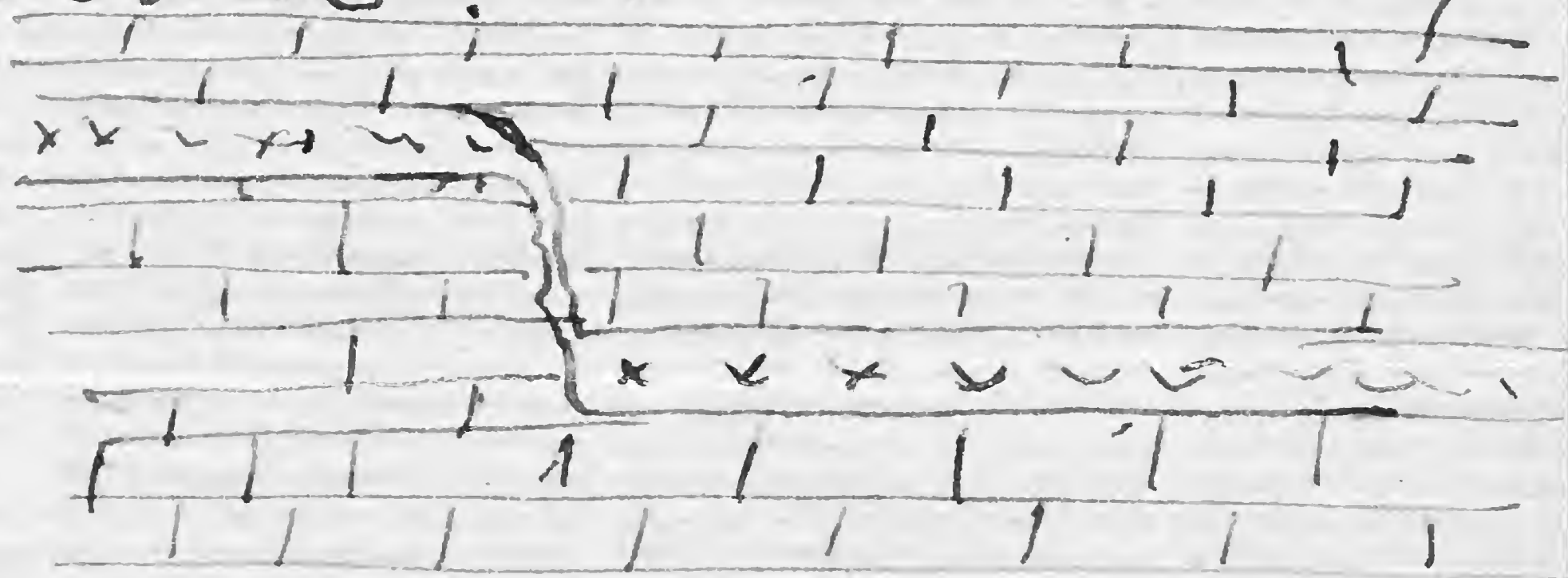
Flathead shales.

2. Thin bedded & sdy shales
with irregular thin
bedded shaly limestone
conspicuous. Middle Comburi
fossils. (a) 150-200 feet.

(5) Intrusive eruptive
occur from 100 feet up -
that are interstratified
sheets. Fragments of the
shales are ~~well~~ shown
in the eruptive on
the north side of Beaver
Creek. The ^{sheets} eruptive adds
about 120-150^{feet} to the thickness

over.

The eruption follows the
parting of the layers on the
line of ~~64~~⁵ bedding for
long 320. distances, but
it ~~may~~ was seen in places
to leave some much
parting & drop a few
feet or disappear
altogether. Occasionally



it bunched up so as
to form a small
locality. In such instances
as the strata were
more or less broken up.

Cambrian (3) Beaver Creek

Total for 2 - 695.

Purple & green argill
shales come in at
about 600 feet.

Limestone

(3.) Thin-bedded bluish-grey
lm - with fossils at base
Qty. $10\frac{1}{2}\%$ 30% S.W.
Str. N. 50° W.

Acrotreta

Ophidea -

a. Lm - 6 ft.

b. Lava - 10"

c. Lm.

At 165 feet^{up} the lm
becomes more massive &
grey in color. but it is
made up of thin layers
grouped in massive layers.
At 360 ft thicker individual
layers appear & continue

17 4

$$\begin{array}{r} 515 \\ \hline 255 \\ 35 \end{array}$$

42

~~85~~

$$\begin{array}{r} 127. \\ \hline 3 \\ \hline 635 \\ 85 \\ \hline 720 \end{array}$$

$$\begin{array}{r} 36 \\ \hline 5 \\ \hline 180 \\ 25 \\ \hline 205 \end{array}$$

$$\begin{array}{r} 1 = 640 \\ 2 = 695 \\ 3 = 720. \\ 4 = 290. \\ 5 = 205 \\ \hline 2550 \end{array}$$

Cambrian (4) Beaver Creek,

to the top of the formation.
Fragments of trilobites occur
here & there but very
rarely.

Total of 3 720 ft

4.

Shale..

Green & purple argill
shale +

290. ft

A bed of lava irregularly
bedded rests on the limestone
beneath the shales of 4.

5. massive bedded grey
to calcitic limestone -
passing above to
bluish-grey thin
bedded fossiliferous
limestone


205.

M.C. fossils.

Cambrian (5) (Beaver Creek)

6.

Light gray, arenaceous, finely granular or subcrystalline
lm. (St N. 40° W. \rightarrow 23° S. W.)

In the lower 25 feet small
Hyalithes 
occur with broken bits
of trilobites. Above the
strata become more
massive & coarser.

A bed of intrusive
lava 3 feet thick occurs
near the base -

135.

2685


Pileman, 6 Beaver Creek

1^a massive bedded, dark
~~stall~~ grey arenaceous
limestone weathering to a
dirty brownish-grey
(oil stain brown) color.

Abscure fragments of
fossils occur at the
base. At 65 feet a
band 18" thick in a
massive layer 3 feet
thick is almost made
up of *Stromatopora*.

Favosites etc.



Abscure fragments of
gastropods & brachiopods
occur 162 feet up &
again at 350 feet when



Silurian. 7 Beaver Creek

in a layer of light gray
fine arenaceous lm. & a
dark layer above -

Noted. Stromatopora
Streptelasma, Helialites

sections of brachiopod 
& gasteropod,  -

Total of 1a 575

1b Light gray arenaceous
lm. that forms a
strongly marked even
topped low cliff -
towards the summit -
St. N. 60° W. > 23° S.W.

180.

Numerous ^{small} cherty nodules
occur in association with
bits of ^{silicified} Stromatopora, on the
thinner layers near the
top.

1a	135.
1b	575.
	180
1c	<hr/> 890.

350.

$$\begin{array}{r} 140_5 \\ \hline 700. \end{array} \quad \begin{array}{r} 1980 \\ \hline 80 \end{array}$$

AE

$$\begin{array}{r} 225 \\ \hline 5 \end{array}$$

$$\begin{array}{r} 1575 \\ \hline 131 \end{array}$$

$$\begin{array}{r} 1125 \\ \hline 130 \end{array}$$

$$\begin{array}{r} 1255 \end{array}$$

Devonian?? 8. Beaver Creek

D Carboniferous

a. Bluish gray thin bedded limestone with cherty nodules & layers of chert in some of the layers. (Layers 1 - 6" - 12" - 24" thick -

This band begins at a saddle west of the slope on the top of 1st. It is a marked feature on the north side of Beaver creek beneath the massive gray congl. - limestone cliffs.

At 375-400 feet noted *Strophomena*

Strophomena ?   2. Sh.

Præstus ?  -

At 740 - feet abundant ~~Devonian~~ fauna

Total of 1^a 780.

375

5

1875


200

2075

2425

~~Heciv~~?? (9) Beaver Creek

1st ^{light} gray arenaceous, to dm thick
fine granular lmn-
in massive beds. In
places, carries cherty
nodules, weather
rough from jagged
cliffs.

x | at 1225 feet up corals
occur 

1850-1900 ft. up
+ at the corals are
in great abundance
Masses of *Diphyphyllum*
2 to 3 feet in diameter.
Syringopora etc etc.

1^c

Shaleys with
interbedded bands of
grey lmn sandstone.
at about 600 feet
up bryozoan remains

(2075)

are abundant. The section is broken by the Missouri river but on the west side of the river high cliffs of sandstone etc rise fully 1000 feet back from & above the river.

1900

S. C.

40.

43.

46.

69.

120

155

Aug. 20th 1900

Lewis & Clarke Pass.

The saddle at the pass
trends N.W. & S.E.

Algonkian

The ^N Belt rocks form
the S.E. side & the ^N Cambrian
Flathead beds the N.W.
The debris of the sch
is scattered all across
the saddle. The

outcrop of Flathead sch
swings west^{erly} leaving
the ^{h.} hills on the west
side of the drainage
line the uncovered
reddish brown Belt
beds & shales, as in the
section measured on the
ridge N.W. of the Pass.

R.M. (7) Pre-Cam

Lewis & Clarke pass. 10 mi south of

1. Grey sdy shales ^{Section near} ~~of~~ Dearborn ^{mine}

thin bedded sds -

at ~~120~~ 120 feet up a layer

of Pseudo-Stromatopora

lm - 2 feet thick occurs

& another at 1210 ft. up.

1210.

2. Thin bedded grey lm -

interbedded with blue

shaly lm - with layers

of interformational corals -

~~limestone~~ formed of thin &

shaly lm - Hard layers

weather buff. At 220 feet

up the blue limestone

disappears - arenaceous

layers replacing it. The

grey lm becomes more

arenaceous & soon gives

way to sdy beds -

285.

3. Grey, hard sdy shales
& sds with reddish

$$\begin{array}{r}
 \cancel{179} \\
 180 \\
 900 \\
 120 \\
 \hline
 1^{\text{st}} \quad 751 \\
 2 \quad 21 \\
 \hline
 790
 \end{array}$$

40

75

- R. M.

8

brown sdy shales & thin
bedded sds alternating
in bands - 20 to 40 feet

St. N. 40° W > 20° S. W.

apart at first. - at 200
feet the reddish-brown
beds begin to predominate.

Total of 3 ————— 225

4. Reddish brown sdy
shales & sds. ————— 790.

No 4. is the Spokane
formation of the Belt
terrace & comes beneath
the Cambrian (Flathead
sd.).

In the first portion
of the section the
grey sdy shales are
beneath the Cambrian
sds.

Beds terrace 9

Heathorn river area.

Lewis & Clarke Pass.

4 Reddish-brown sdy sh & sds. 790.

(Shakane.)

3 Grey sdy sh & sds 225.
(Greysan)

2 Siliceous grey lm 285.
(Newland)

1 Grey sdy sh & sds 1210
(Chamberlain)

2510

8-27-1900

Montour Creek Section.

Montour Cr. and its several branches have rooded deep canons in the massive hard siliceous shales and sandstones that form the range on the north side of the Big Blackfoot Valley, from a little W. of the Lewis & Clarke pass to Montour Cr., and beyond.

Montour Cr. and its principal E and W branches are base-levelled for about 3 mi. above where the two branches unite. Below the union of the two branches to canon is a mile or more broad, and the stream is engaged principally in moving the detritus washed into it from above.

It has the broad U-shape characteristic of glaciated valleys. On the E side of the mouth of the canon there is a thick belt of conglomerate, formed of the rocks derived from the drainage basin of Montour Cr.

Montour Cr. Sect. (cont.),

This conglomerate appears to be of Tertiary or pre-Tertiary age, as it rises high above the glaciated plain that extends for 6-10 mi. southward from the mouth of the canon.

Rock section. At the top of the Lewis & Clarke pass, beneath the Flathead sandstone, there is a series of reddish-brown and greenish sandstones, dipping westward. These apparently pass beneath reddish & purple sandstones that form the mass of Stonewall Mt., the crest of which is a syncline. The structure was not traced westward of this; but apparently the reddish-brown and green sandy shales, sandstones, and massive gray and quartzitic sandstones, that are several thousand feet in thickness in the Montour drainage basin, represent the series that comes above the Lewis & Clarke pass section and above the rocks of the Belt Terrane as developed in the Big Belt mts.

18-24-1900

Conglomerate at mouth of Canon
of Montour Creek. Massive

conglomerate, several hundred feet thick, forming high hills on the E. side of the canon about 6 mi. N-NW of O vando, Mont. Matrix of conglomerate a fine yellow sand. Conglo formed of limestone, - bluish gray, buff, and buff mottled with irregular wavy threads and benches. Bluish gray limestones; also gray, purple, mottled purple and buff, reddish brown, yellow sandstone; also hard purple and buff arenaceous shales. Boulders of limestone 2 ft. across, with very irregular angles occur. Most of the material bears evidence of having been deposited within a comparatively short distance of its source.

• So far as observed the material appears to have come from formations of the Belt Terrane.

Intrusive sheets of basal
> occur (5 feet at 225 ft 20 feet at 660.

July, 24/1900.

Rocky Mts. Section ^{4 mi} west
of Stearns P.O. Lewis &
Clarke Co. Mont.


Section begins with a
thin bed of lm. resting
on an intrusive (a little N.W.
of Steinbach & Alt. ranch
house).

From base up.

1. (a) Bluish-gray lm. in
thin layers. 15 ft

(b) ~~Siliceous & arenaceous shale~~
~~& thin bedded greenish~~
Thinly & thin bedded
siliceous & arenaceous
shales, greenish colored
with occasional bands
of purple up to 715.
when purple predominates
(over) 960.

$$\begin{array}{r}
 170 \quad 5 \\
 \hline
 850. \\
 110. \\
 \hline
 960.
 \end{array}$$

The dip begins at 30°
 & then passes over a low
 chart wave before reaching
 the 1st lava bed 
 continues at 20° for some
 distance & then gradually
 increases to 45°

$$\begin{array}{r}
 429. \\
 563. \text{ Lava} \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 134. \quad 44 \\
 5 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 670. \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 760 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 925 \\
 2430 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 3406. \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 429. \quad 143 \\
 5 \\
 \hline
 2145. \quad 286 \\
 286 \\
 \hline
 2431
 \end{array}$$

$$\begin{array}{r}
 47. \quad 16 \\
 5 \\
 \hline
 235 \\
 36 \\
 \hline
 263
 \end{array}$$

R. M. Section. (2)

c) Massive layer of ~~gray~~
fine y⁵ calcarenate
~~arenaceous~~ 2.

d) Purple arenaceous shales
with occasional thin
beds of greenish shale.
St. N. 50° to 60° W. > 45°
An the greenish
colored shales predomi-
nate with bands of
purple. This great
bed of arenaceous
shale is without
traces of life as far
as known. 2430.

e) The shaly beds of (d)
become more siliceous
& banded & pass into
banded siliceous beds.
At 260 feet an ~~intrusive~~
sheet of dark ~~basaltic~~
intrusive lava

$$\begin{array}{r} 385 \\ 5 \\ \hline 435 \end{array}$$

$$\begin{array}{r} 115, \\ 5 \\ \hline 575, \\ 25 \\ \hline 650. \end{array}$$

$$\begin{array}{r} 203 \\ 5 \\ \hline 1015 \\ 135 \end{array}$$

26

$$\begin{array}{r} 80. \\ \hline 400 \\ 450, \\ 760, \\ \hline 1215 \end{array}$$

1950

comes in - 35. feet.
 Seventeen feet above the
 lava a layer of dark
 siliceous slaty shale 3
 feet occurs - that is much
 like the Chamberlain's
 shale of the Belkterone.
 Some of the bands of shaly
 beds are light grey - others
 greenish. There will be
 a few feet of arenaceous
 beds & then compact siliceous
 banded layers that are
 almost flint-like in
 appearance.

^{very} mud cracks occur at
 various horizons indicating
 deposition between tides.
 Total of E - 1215.

f. Purple siliceous beds
 passing to thin bedded
 fine grained sds & to
 shales similar to those

1) a - 151
 b - 960.
 c - 2
 d - 2430
 e - 1215

July 20.
 4622.

f - 1150.

2) a - 435 - km.

3) ~~a~~ - 75

~~a~~ - 205

c - 4

d - 225
 6716.

of (d). Thin bands of
greenish-colored arenaceous
shale are interbedded
at irregular intervals.

Dip. N. 40° W $> 25^{\circ}$ S. W.
near base. At about
1000 feet up S. N. 40° W.
 $> 30^{\circ}$

Greenish shales (arenaceous)
& thin beds of red freedom
in at 650 & up.

1150

2^a

Gray, slightly siliceous
but weathering buff.
Shaly to layers a foot
thick. At 230 feet up
blue layers are inter-
bedded & at 255, massive
layers of intraformational
conglomerate, broken
up shaly, blue but.
Colitic layers also occur
at several horizons.

435

R. M.

5

Total of 2

435.

A. Buff sdy shale B. 75

b. Thin bedded grey sd weathering buff-grey, with greenish tints - 205

c. Pseudo-stromatopora lm - 4.

d. Thin bedded greenish gray sandy strata up to 160 feet when the color changes to gray weather gray buff. 225.

~~cross~~
e. Massing bedded coarse sd. with small qtz pebbles.

[illegible]

36.

R. M.

(6.)

Cambrian

1^a

massive, cross bedded
coarse sd with small
white qtz pebbles. 255.

1^b

Thin bedded sand-
stones & ^{sd} shales with
numerous animal trails
& fragments of trilobites -
Asaphiscus -
Hyolithes -

The sandstone 1^a =

Flattened sandstone

1^b =

" shales -

A few thin beds of lm -
& then a fault cuts
off the section.

210
5

1450.
+

~~115~~
5

150
250

250.

40

1880.00

6^a

Belt Terrane.

Hearton river area.

Cambrian.

Grey sds.

510.

Siliceous lm (Helena lm) 435.

Purple arenaceous sh
& sds.

1150.

Grey & greenish sh & sds 1215.

Purple & green ar. shals 2430.

Greenish arenaceous shale

960.

5755

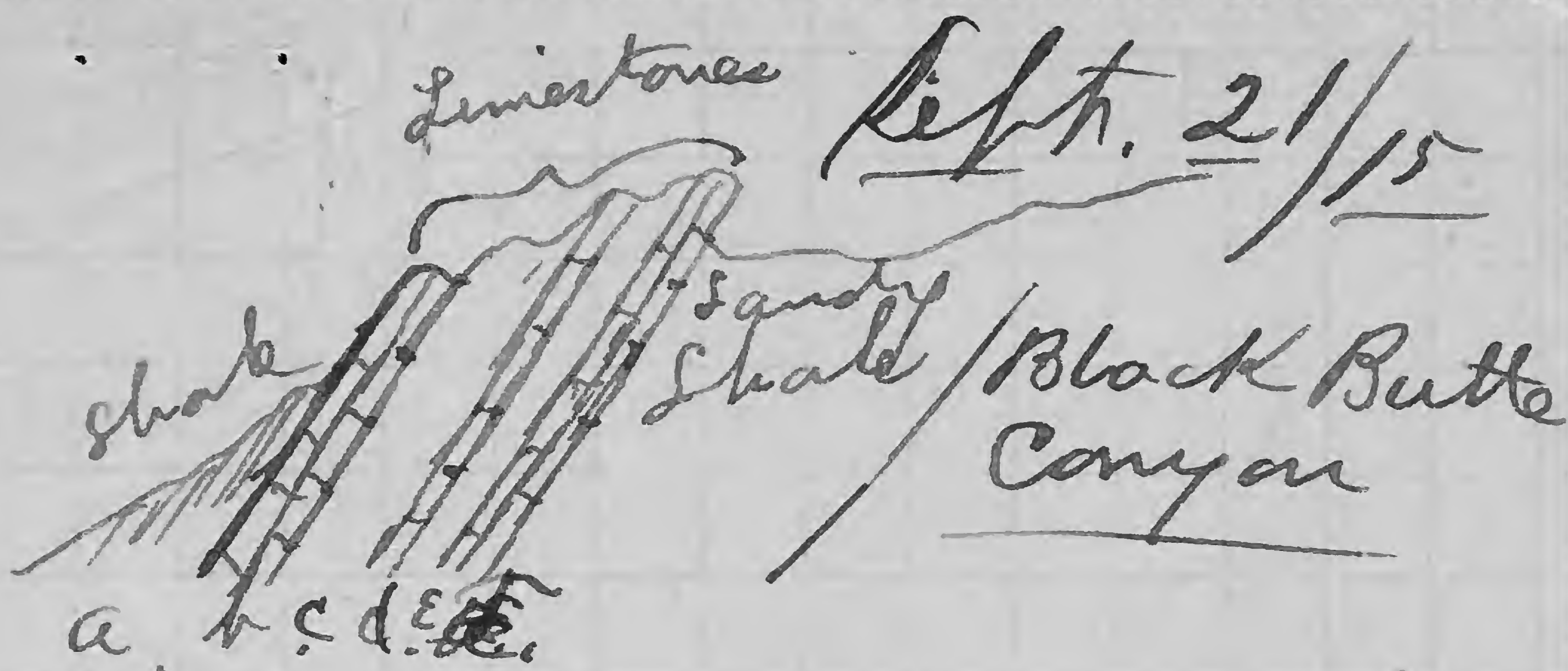
Lm - (Cap of Newland)

15

6770

Eruptive -

Greyson, Spontaneous & Eruptive.



- a. upper arenaceous shale
 b. Canyasia
 c. ~~Newlandia~~ major
 d. Greysonia

Section going down -
 a. Shale (arenaceous) grey
 b. Thin bedded, bluish-grey limestone without traces of fossils H. 21.

c. Bluish grey limestone in layers
 a bed of algal deposit Canasá
 occurs at the top as a layer 12 to 14 in thick.
 Beneath this a layer 6 in thick



f. Same as (d) with
a trace of coarse
algal deposition in 3-6
upper thick layer.

g. Algal bed with filling
of bluish-grey limestone.
20 inches -

h. Layer of bluish-grey lm.
with algal remains
less abundant than
in i. 9 in

2-5

35-

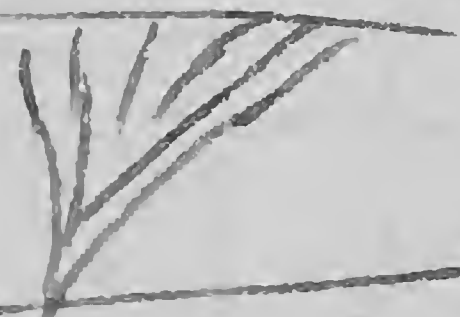
h. Grey arenaceous
shale -

The above algal bed
is finely exposed on
east side of canyon
(Black Butte) entering
Deep Creek canyon from
the south just above
the Forest Ranger Station
& 4 1/2 miles above

Glenwood on Deer
Creek +

The lower bed of
algal remains is peris-
tent for about $1/4 \pm$ of
a mile

It is made up of one
species that has an
almost plant-like growth
in places.



See collections.

401 -

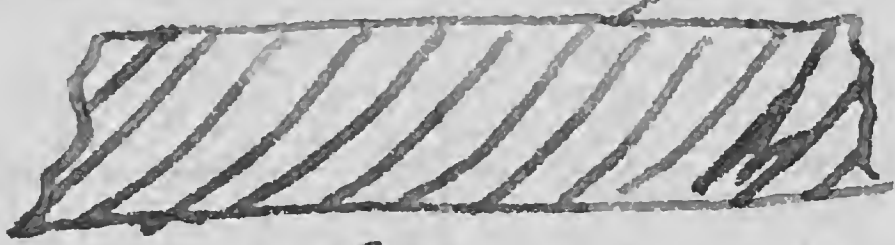




Sept. 21/15

Newlandia major.

Occurs in layer 6" to 8" thick that ~~extends~~ ^{continues} for a long way, ^(1200 feet) on the east side of Black Butte canyon - wh enters Deep Creek Canyon from the south just above the Forest Ranger Station.

The partitions extend from the bottom to top of layer  and show concentric rings ~~into~~ at upper surface.

